1,178,244

PATENT SPECIFICATION 1,178,244

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Change-Speed Gearing with Overdrive for all Ratios, for Example for a Motor Road Vehicle.

We, THE STANDARD-TRIUMPH MOTOR COMPANY LIMITED, a British Company, of Canley, Coventry, Warwickshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a change-speed gearing with overdrive for all ratios, for example for a motor road vehicle. It is commonplace for a change-speed gearing for a motor road vehicle to have the different, selectable forward ratios driven through an idler gear wheel permanently meshed with a transfer gear wheel fast with an input shaft (e.g., the output of a clutch in the drive from the vehicle engine), and an improvement in such a change-speed gearing, whereby the idler gear wheel is eliminated, is the subject of our Patent Specification No. 10,493/66 (Serial No. 1,117,347). In accordance with the latter a change-speed gearing, for example for a motor road vehicle, includes parallel input, output and intermediate shafts, the output gear wheels of the gear wheel pairs for each forward ratio are journalled on the output shaft and selectively clutchable thereto by clutch members which are slidably but relatively non-rotatively mounted on the output shaft, the coacting input gear wheels of the gear wheel pairs are rigidly interconnected and journalled on the intermediate shaft, and the one of the said coacting input gear wheels which is for providing top gear ratio is permanently meshed with a transfer gear wheel fast on the input shaft.

According to the present invention a change-speed gearing includes parallel input, output and intermediate shafts, two gear wheels on the input shaft, at least three gear wheels on the intermediate shaft and at least three gear wheels on the output shaft, the gear wheels on the input and output shafts are jurnalled thereon and selectively clutchable thereto by clutch members which are slidable but relatively non-rotatively mounted on the respective shaft, the gear wheels on the intermediate shaft are rigidly interconnected, each gear wheel on the input shaft meshes with a different one of the gear wheels on the intermediate shaft, and each of the gear wheels on the intermediate shaft meshes with a different one of the gear wheels on the output shaft.

Conveniently there are four pairs of gear wheels, one of each pair being on the intermediate shaft and meshing with the other of each pair which is on the output shaft.

One embodiment of change-speed gearing with overdrive in accordance with the invention, applied to a change-speed gearing normally providing four forward ratios and one reverse ratio, and applied to a front-wheel-drive transmission for a motor car is illustrated in the accompanying drawing, in which:—

Figure 1 is a side elevation, with the drive to the differential gearing shown in section, and

Figure 2 is an enlarged longitudinal vertical sectional view of that portion of Figure 1 which lies to the right of the line 2—2 in that Figure.

In the Figure 1 the engine is indicated generally at E, its sump at S, and a differential transmission D to the driven wheels (not

shown) is shown accommodated in a compartment which is within the bottom of the sump and closed at the bottom by a detachable cover plate P. The engine drives the differential transmission through a clutch in housing C and a change-speed gearing within a casing indicated at G.

The change-speed gearing shown in Figure 2 includes a main input shaft 10 (which is the output shaft of the clutch in housing C in the example shown), an output shaft 11 and an intermediate shaft 12. A unitary cluster of four gear wheels 13, 14, 15 and 16 providing forward ratios, and a fifth gear wheel R which, with gearing not shown, provides a reverse drive ratio, has a hub portion 17 freely journalled on intermediate shaft 12, and complementary gear wheels 13*a*, 14*a*, 15*a*, 16*a* and R*a* are independently journalled on output shaft 11. The facing ends of gear wheels 13*a* and 14*a* are provided with respective coaxial rings of dog-clutch teeth 13*b* and 14*b* for selective coaction respectively with complementary dog-clutch teeth 13*c* and 14*c* of a selector ring 18 which is slidably splined to a hub 18*a* in turn splined at 19 to output shaft 11. The selector ring 18 has a peripheral groove engaged by a fork 20 fast with a selector rod (not shown) which is slidable in a conventional manner by the operation of a gear lever, also not shown.

A similar selector ring 21, operable in a conventional manner by a fork of a second, and parallel selector rod (neither of which is shown), is slidably splined to a hub 21*a* in turn splined to shaft 11 at 22, and it has rings of dog-clutch teeth 15*c*, 16*c* for selective engagement with dog-clutch teeth 15*b*, 16b of gear wheels 15*a*, 16*a* respectively.

It will be seen that the right-hand end of output shaft 11 is supported from casing G by a substantial ball bearing 23, while at the other end of the said casing it is supported by needle rollers 24 within a boss 25 of casing G.

The left-hand end of output shaft 11 is connected by an internally splined sleeve 26 to an extension shaft 27 supported in a roller thrust bearing 28, and extension shaft 27 carries a hypoid bevel pinion wheel 29 of the differential gearing.

Input shaft 10 extends with radial clearance into a tubular shaft 30 to the remote end of which it is splined at 31, and shaft 30 is supported at its opposite ends by ball bearings 32, 33 which are held in an extension GI of the casing G by end plates 34, 35.

Journalled on tubular shaft 30 are two transfer gear wheels 36 and 37, and between them is a selector ring 38 slidably splined to a hub 38*a* in turn splined at 39 to said shaft 30. Ring 38 has a peripheral groove engaged by a fork 40 by which, and a control (not shown), the said ring can be slid for dog-clutch teeth 41 to engage coacting dog-clutch teeth 42 fast with transfer gear wheel 36, or for dog-clutch teeth 43 to engage coacting dog-clutch teeth 44 fast with transfer gear wheel 37.

It will be observed that the splines in selector rings 18, 21 and 38 form the dog-clutch teeth for engaging the dog-clutch teeth on the gear wheels with which they coact, and that each of the gear wheels has an externally dog-toothed synchronising cone 45. It will also be observed that the hubs and gear wheels are located axially of their respective shafts by spacers 46.

In the example given, when gear wheel 36 is made rotationally fast with the input shaft the input drive is directly from gear wheel 36 to gear cluster 13, 14, 15, 16 and R instead of through an intermediate idler gear wheel as hitherto, and this direct drive is to gear wheel 13 which, when dog teeth 13*b*, 13*c*, are interengaged to entrain gear wheel 13*a*, which is of the same size as gear wheel 36, causes output shaft 11 to be driven at unit ratio. It will also be seen that if, instead, dog teeth 14*b*, 14*c* are interengaged, gear wheel 13 then acts as a transfer gear wheel to enable gear wheels 14 and 14*a* to drive output shaft 11 at the next lower ratio. Gear wheel 13 also acts as a transfer gear wheel for enabling the said output shaft to be driven at either of the other two ratios or in reverse depending on which of dog teeth 15*b* and 15*c*, or 16*b* and 16*c* are interengaged.

When, however, dog-clutch ring 38 is slid to disengage dog-clutch teeth 41 and 42, and instead to engage dog-clutch teeth 43 and 44, the drive to the gear cluster is through gear wheels 37 and 14, and as gear wheel 37 is of larger diameter than gear wheel 36 an overdrive is applied to all ratios. Of course, when the input drive is from gear wheel 36, gear wheel 37 will be rotated idly by gear wheel 14, and when the input drive is from gear wheel 37 gear wheel 36 will be rotated idly by gear wheel 13.

It will be observed that all of the change-speed ratios, and the overdrive device are shown in neutral positions.

It will be appreciated that by adding a third transfer gear wheel, say, beyond the right-hand side of transfer gear wheel 37 meshing an additional gear wheel of the cluster, and providing their adjacent ends with dog-clutch teeth like 42 and 44, between which would be arranged another selector ring like 38, a second overdrive, or an underdrive ratio could be provided depending on the relative diameters of the third transfer gear wheel and the coacting, additional gear wheel of the cluster.

WHAT WE CLAIM IS:—

1. A change-speed gearing, including

parallel input, output and intermediate shafts, two gear wheels on the input shaft, at least three gear wheels on the intermediate shaft and at least three gear wheels on the output shaft, the gear wheels on the input and output shafts are journalled thereon and selectively clutchable thereto by clutch members which are slidable but relatively non-rotatively mounted on the respective shaft, the gear wheels on the intermediate shaft are rigidly interconnected, each gear wheel on the input shaft meshes with a different one of the gear wheels on the intermediate shaft, and each of the gear wheels on the intermediate shaft meshes with a different one of the gear wheels on the output shaft.

2. A change-speed gearing, according to Claim 1, in which there are four pairs of gear wheels, one of each pair being on the intermediate shaft and meshing with the other of each pair which is on the output shaft.

3. A change-speed gearing, constructed and arranged and adapted to operate substantially as described herein and as shown in the accompanying drawings.

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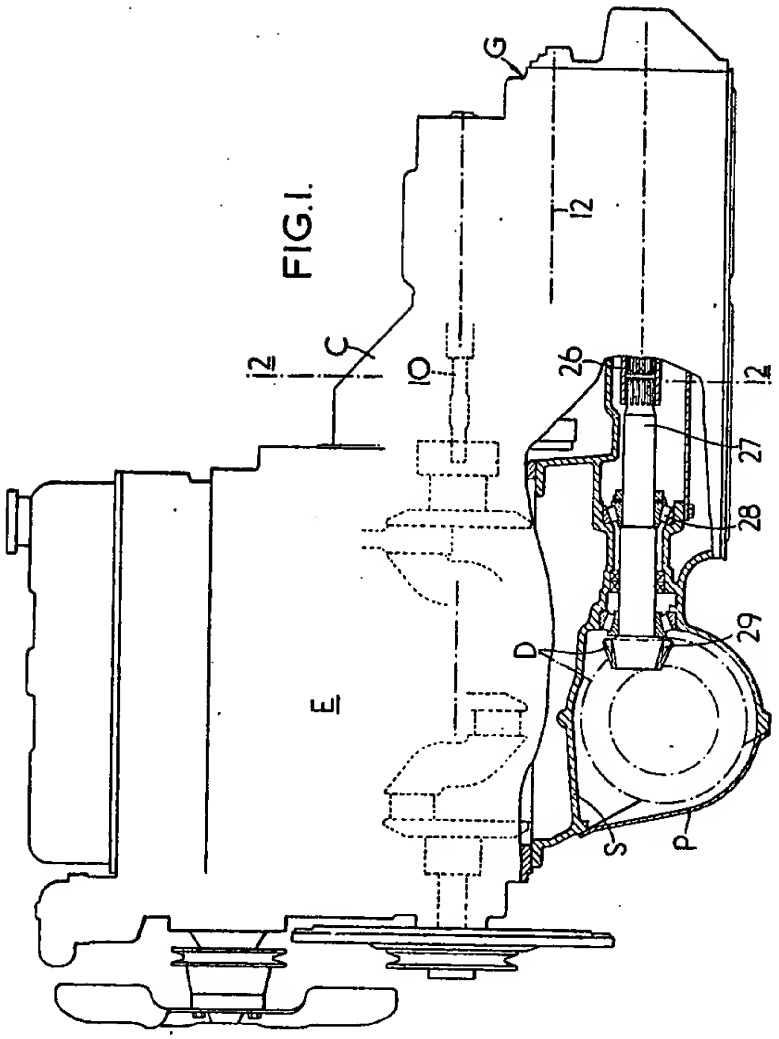
1178244 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1.



1178244 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

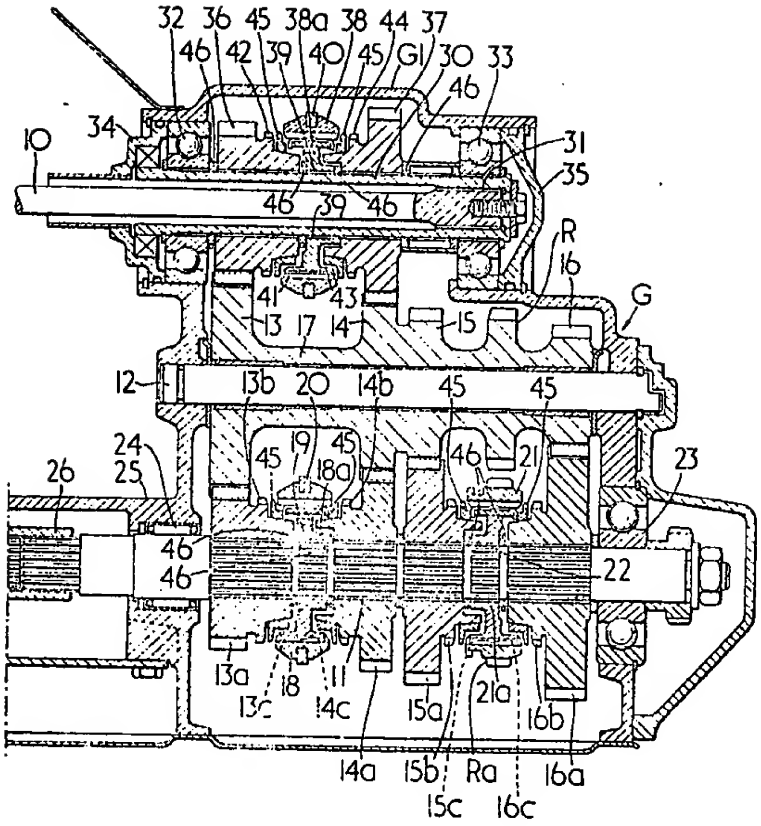


FIG. 2.